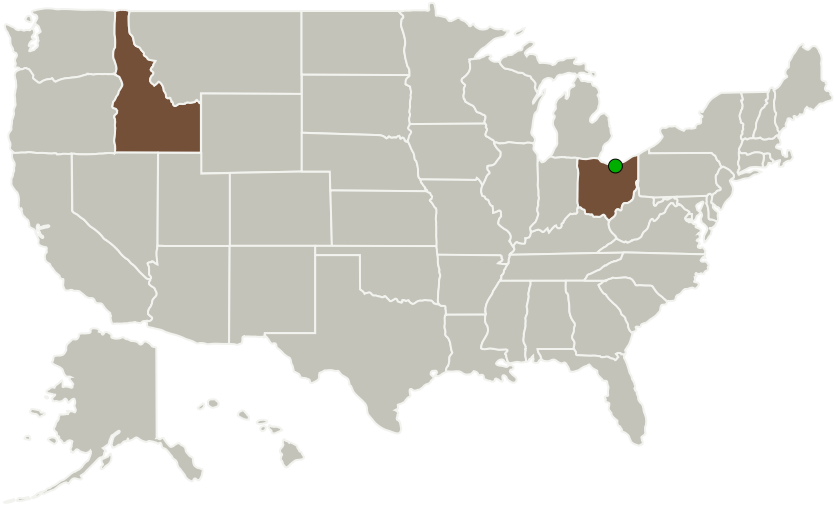
Enhanced Prediction of Gear Tooth Surface Fatigue Life, Phase I

Completed Technology Project (2010 - 2010)

Project Introduction

Sentient will develop an enhanced prediction of gear tooth surface fatigue life with rigorous analysis of the tribological phenomena that contribute to pitting failure. Advanced mixed-elastohydrodynamic lubrication (EHL) models that are capable of fully describing the tribology of the mating gear teeth will be utilized to determine the influence of surface roughness and asperity interaction on the stresses driving the degradation of the surface. These factors are not rigorously addressed by currently available solutions. The lubrication analysis will be coupled with a damage accumulation algorithm that takes into account fatigue initiation at the level of the material microstructure. This integrated software will be the world's first physics-based gear tooth life estimation model with rigorous consideration of lubrication and pitting/scuffing damage progression in nominally loaded and misaligned gears. When complete, an end-user of the software will input the design parameters of a gearbox along with a mission load spectrum, and the software will output the estimated service lives of its gears. If the historical or anticipated load spectrum happens to change, the altered spectrum can be input and the life recomputed. This flexibility provides the most accurate and up-to-date estimations of both the current gearbox health and of the remaining life.

Primary U.S. Work Locations and Key Partners



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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Sentient Corporation	Lead Organization	Industry	Idaho Falls, Idaho
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Idaho	Ohio

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Summary: Enhanced Prediction of Gear Tooth Surface Fatigue Life, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/138981)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Sentient Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

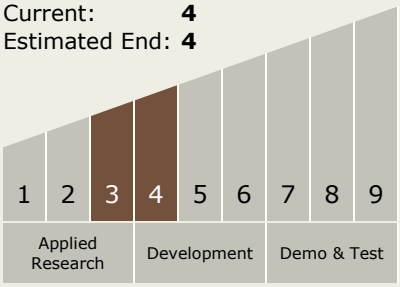
Carlos Torrez

Principal Investigator:

Nathan Bolander

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
  - TX13.2 Test and Qualification
    - TX13.2.6 Advanced Life-Cycle Testing Techniques

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System